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ABSTRACT

This manual describes the Rachel Carson Project, an attempt to introduce environmental education lessons and units into the existing courses of study within a high school. The document provides a rationale for proceeding in this manner rather than implementing environmental education through the introduction of new courses. Included is a description and evaluation of the innovation process. The process as proposed centered around a core planning team of three teachers utilizing released time to develop materials that were then to be tried in their classes. This plan was modified to include informal, individual conferences between project staff and the entire teaching staff. The appendixes of this report include 22 descriptions, by teachers and others, of lessons, unit plans, and other project activities. (Author/MLB)

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Final Report

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OPERATING MANUAL FOR RACHEL CARSON HIGH

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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ABSTRACT

The Rachel Carson Project had as its major objectives: (1) to pervade the curriculum and extracurriculum of a high school with environmental education, by introducing appropriate lessons and units into existing courses of study rather than through the creation of new courses, and (2) to prepare an "operating manual" containing the materials developed, along with a description and evaluation of the innovation process.

The process as proposed centered around a core planning team of three teachers utilizing released time to develop materials which were then to be tried in their classes. This plan was impeded by circumstances within and surrounding the school, and yielded to a process of informal, individual conferences between project staff and the entire teaching staff. This change, among others produced a reasonably satisfactory level of attainment of the objectives.

The appendices of this report include twenty-two descriptions, by teachers and others, of their lessons, unit plans, and other project activities.

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PREFACE

The general objectives of the Rachel Carson Project were twofold:

1) To pervade the curriculum of a high school with environmental education, not through the introduction of one or two special new courses, but rather through the introduction of appropriate units and lessons into existing courses, with participation by most of the teachers.

2) To prepare a document containing those lessons and units, so that they might be made available to other interested teachers and school districts.

In the main body of the report, we shall discuss the background, the process, and the problems involved in attaining the objectives above. This section of the report shall be rather brief, for the following reasons: (a) the lessons and units themselves appropriately constitute the bulk of the report; (b) reports of the project activities have been or are being widely disseminated by means other than this report.

In a memo to grantees dated June 13, 1972, the Environmental Education Office recommended brevity in the main body of the report, given conditions (a) or (b) above. We are happy to comply.

The documentation of the second general objective is in the form of reports by teachers, consultants, and others associated with the project. These documents, twenty-two in number, constitute appendices to this report. Because of their bulk, most are bound separately from this portion of the report.

We wish to thank all of those who participated in the project, and we especially wish to thank Dr. Clarence D. Kron, now Chairman of the Department of Education at the new University of Texas of the Permian Basin in Odessa. As Superintendent of Corvallis Schools, he offered the unfailing support which made the project possible. We are confident that vision and dedication will continue to characterize his performance at his new position, as was true here. We wish to thank also our new Superintendent, Dr. Thomas D. Wogaman, for continuing to provide an atmosphere congenial to our work during its final stages. Finally, the three secretary-typists who served so well successively during the project period, must not go unthanked - Laila Metzger, Glenda Samuelson, and Teddy Colbert.

- R. Thomas Tanner, Project Director

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INTRODUCTION

This section contains the philosophical background and the pre-proposal history of the project.

The basic premise of the project is, first, that a positive environmental ethic should pervade our culture, and that perhaps the best way to encourage this in the schools is to try to pervade the culture of the schools with this ethic or at least with its logical antecedents. The vehicle for this diffusion would be a subtle pervasion of the school, rather than an isolating of environmental studies in one or two new courses in "environment" or "ecology." The rationale for this can be set forth by example: "optimism," "industriousness," "pragmatism," and "materialism" are widely regarded as American traits. We do not teach courses entitled "optimism" or "pragmatism." If the internalizing of these values is, indeed, a part of the American enculturation experience, it is accomplished by more subtle and pervasive means. The Rachel Carson Project is, in part, an attempt to emulate these means. It was hoped that if teachers representing (nearly) all disciplines worked toward their normal course objectives, frequently utilizing environmental studies as their vehicles of instruction, it would subtly illustrate the desired and ideal - and yet unrealized - importance of the environment in our culture. As the project's associate director said one day to some art and English teachers, "You should develop the esthetic sensibilities of your students without ever mentioning that you are engaging in environmental education."

There is obviously a hierarchy of subtlety which obtains here. Focusing for a moment upon the teacher and his actions or words, the "mention," the "10-minute illustration," the "one-hour lesson," the "two-week unit" and the "one-semester course" become decreasingly subtle and pervasive, and increasingly isolated, as we proceed through the list. The twenty-two reports included here tend to illustrate the middle of this spectrum. That is, the project did not encourage new courses on the one hand, but on the other we recognized that the recording of very small units of teacher behavior ("mentions," "illustrates") was probably not the best way to convey useful information to others in the teaching community, however useful such recording might be in certain educational research. Hence, our twenty-two reports tend to illustrate the "lesson" and the "unit," though there are exceptions in both directions.

There is another form of subtle pervasion, however, which is perhaps more important than the length of the unit of teacher behavior. That is the pursuit of environmental studies without the conspicuous use of labels such as "ecology" or "environment" which appear already to have become tedious for learners. For instance, a physics class may study alternative energy sources for Spaceship Earth (we did), or a literature class might discuss a naturalist's essays (we did) without

undue labeling, isolation, or "ecological fanfare" to introduce the unit. In this manner, segments as gross as the one-hour lesson or the two-week unit may become subtle instruments of enculturation, by adopting these study areas as accepted, natural portions of one's class in physics or literature. At least, this is an assumption which underlay the project.

Two questions arise logically at this point. Was there an attempt in this project to define the environmental ethic to which it was addressed, or to define the limits of environmental education? And, was there an attempt to indoctrinate to a particular viewpoint, the "environmental ethic"?

There was an attempt to impose reasonable limits on the scope of environmental studies in the project. In general, there was a concentration upon: man-earth relationships; the finite nature of the earth's resource base and the great demands upon that resource base by human populations experiencing population and economic growth; the ecological and esthetic values of a varied environment (in difference to a homogeneously man-dominated one). Other problem areas, such as drug abuse, war, or racism, were considered only as they related explicitly to the above parameters. In short, man-earth relationships were emphasized; man-man relationships were treated only as they elucidated man-earth relationships. Items 1-6 in the bibliography further define and illustrate the conception of environmental education which guided this project.

We are reluctant to attempt specific definition of the ethic referred to, but would note that it is one of responsibility - toward one's fellow man, toward all other living things, toward our posterity - in view of the scope suggested above. Again, see bibliography items 1-6.

In answer to the second question above, indoctrination to a particular viewpoint was not attempted. Rather, we felt it more important and appropriate that the project impress students with the importance of environmental studies, rather than with the rightness of the ethic alluded to. We felt that consideration of fact and of opposing viewpoints would tend to lead learners to desirable attitudes without overt attempts at indoctrination.

It must be noted that teachers were not and could not be expected to conform unanimously to the scope and ethic suggested above, any more than were students. We did not, however, note considerable disparity between teachers and project personnel in this regard.

A corollary of the project philosophy is that if the normal course titles are retained, studies within those classes should respect the integrity of the disciplines. School should not become a series of a-disciplinary "mini-Earth-Days." A casual visitor to a participating class should be able to identify the subject area of the class rather quickly, e.g. "biology," or "English."

The pre-proposal history of the project begins, for all practical purposes of reporting herein, during the 1970-71 academic year. During that year the then Superintendent, Dr. Clarence D. Kron, was formulating final plans for opening of the new Crescent Valley High School, scheduled to open in September, 1971. One of his actions was to convene groups of local teachers to serve as advisory committees on the curriculum of the school. The first of these committees to meet was the science-mathematics group, chaired by - as it turned out - the project-director-to-be. With no prompting from him, the group took a strong position in favor of what they called "science for survival" or "science for Spaceship Earth." They eventually authored a position paper from which the following is extracted:

> Philosophy
>
> The first graduates of Crescent Valley High School will be about 45 years of age at the end of the current millennium. This committee began its deliberations with the questions: What should these young people be like at that time? What should they be able to do? It was the committee's assumption that recommendations regarding the curriculum would flow rather directly from these questions and their answers. Indeed, they have.
>
> Our first graduates at Crescent Valley will be among the seven billion heirs to a world, and among the 280 million heirs to a nation, in which the web of life will have been stretched even more tautly by human numbers, and by the demands of those numbers upon the Earth's resources of materials, energy, and elbow room.
>
> A major shift in the relationship between man and nature will probably have to occur during the lifetime of our first generation of graduates. As public school teachers in a constitutional democracy, the committee members are dedicated to the proposition that our students should, as adults, have every opportunity to participate with intelligence in the decision-making process. If ecological conditions require a major rethinking of the American

ethos, this should be the responsibility of the citizenry. If the life support system of Spaceship Earth requires a new Renaissance in the world-view of the Earth's inhabitants, our graduates should have opportunity to participate actively and intelligently in the Renaissance process.

Therefore, as public school teachers in a constitutional democracy, we recommend:

a) The education of citizens who will be willing and able to govern themselves in a period of unprecedented ecological stress. Such education must necessarily include:
b) Free and open examination of critical issues in the public school classroom, where a diversity of informed opinion is critically examined.

As teachers of natural sciences and mathematics, we therefore recommend:

a) That science and mathematics <u>instruction</u> at Crescent Valley High School be characterized to a considerable degree by student inquiry as exemplified in part by the new science curriculum materials produced during the last decade. (BSCS, The Biological Sciences Curriculum Study; ESCP, The Earth Science Curriculum Project; CHEM Study, the Chemical Education Materials Study; and so forth.)
b) That the science and mathematics <u>curriculum</u> at Crescent Valley have three major emphases:

    1) The natural sciences and mathematics per se, with appropriate attention to the structure of the disciplines of science, their major theories and constructs, some of which tend to be unifying across disciplines, some of which are peculiar to the several disciplines.
    2) <u>Science for the Spaceship Earth</u>. This study must be interdisciplinary, not only across the sciences, but across the humanities and social sciences as well.
    3) Mathematics which, first, yields acceptable minimum standards of competence in computation. Mathematics which, second, acts in the service of 1) and 2) above, as well as in the service of other curricular areas from electronics to the social sciences.

During the past two years, "environment," "ecology," population," and "pollution" have received considerable exposure in the mass media. The committee's recommendations are not merely in response to a current fad; as teachers of natural science and as citizens, we view the condition of the environment as an ongoing human problem of the first magnitude. In fact, we believe that the very attention being directed toward the environment in the mass media places a special responsibility upon the schools:

a) To set an otherwise fragmented body of information and opinion into the context of larger patterns of thought; to encourage holistic, rather than simplistic thinking. For example, it is simplistic to view the electric automobile as a solution to the environmental problems associated with the internal combustion engine if, in fact, a whole new set of environmental problems may be associated with the electric auto.

b) To provide an opportunity for critical inquiry, for examination of competing but informed points of view. To provide access to resource persons and resource materials representing a spectrum of informed opinion. The proximity of Oregon State University is beneficial in this regard.

c) To help ameliorate the pessimism and alienation which burdens many of the young, and which often include a rejection of science and technology which are regarded only as sources of many dilemmas of the day. To demonstrate the necessity of science (e.g., population dynamics, population genetics) and technology (e.g., in the recovery and recycling of materials) as means toward truly humane ends. To perpetuate and renew the optimistic American spirit of "can do" in a generation which otherwise may be overprogrammed with problems and underprogrammed with real and potential solutions, (7, pp. 1-4).

The committee goes on to recommend some possible themes for the curriculum:

1. The "three major concepts" of the People and Their Environment series, written by the Conservation Curriculum Improvement Project. The concepts are: (a) Living things are interdependent with one another and with their environment; (b) Organisms (or populations of organisms) are the product of their heredity and environment; (c) Organisms and environments are in constant change.

2. Three themes "intended mainly to be suggestive and catalytic," as proposed in a 1970 article by Tanner (2). The themes (which are further elucidated in the article): (a) Technology and Mankind: A Master-Servant Relationship?; (b) Tomorrow's Technology and Today's license (this theme is restated in a later article by Tanner as "An Ounce of Political Prevention May be Better Than a Pound of Technological Cure"); (c) Man in Nature, Man over Nature.

3. The committee recommends that additional transdisciplinary themes and objectives be developed by the advisory committees and/or staff in the sciences, social sciences, and humanities working in league. Possibilities which have arisen in our discussions include: (a) The future of the American ethos; (b) Science in the service of man, rather than as an end unto itself; (c) The right of the layman to hold the specialist accountable for answering his questions regarding the potential effects of technological innovations; (d) The evaluation of conflicting "freedoms" in a post-frontier society; (e) etc. (7, pp. 11-12).

Although the advisory committees in the other curriculum areas were by no means as steadfastly oriented toward environmental education, they did include environmental education in their philosophy statements.

More-or-less concurrent with the writing of these statements, the Phi Delta Kappan published in March, 1971, an article entitled "A Day at Rachel Carson High" (3), written by the project director. In it, he described a day in one student's life at a fictitious high school. On that day: Joe's chemistry II class is studying the chemistry of the internal combustion engine and its emissions; his American problems class is dealing with the old American values of freedom and equality before the law, in relationship to the natural resources and natural environment of contemporary America; his English class is reading a novel about a man who does battle with elephant poachers; and so on through the day. Furthermore, the school's teachers have one of their regular staff meetings that day, to plan the curriculum around themes similar to those elucidated above.

In spring of 1971, with the full support of Superintendent Kron and the encouragement of the statements by the advisory committees (especially science-mathematics), a proposal was written in response to Public Law 91-516, the Environmental Education Act. The proposal was approved and submitted by the Corvallis School Board on May 26.

In it, we proposed to simulate the fictional Rachel Carson High at our new high school, Crescent Valley.

To clarify and summarize this chapter, we quote from that proposal:

> The first and most significant problem is the need for integration of EEE across the entire curriculum of a comprehensive high school, with planning of the curriculum by the entire staff working in coordination. Examination of such journals as Environmental Education and The Science Teacher confirm that EEE, as practiced in any one school, is likely to be concentrated in one or two classes by teachers working solely on their own. In one school this may be a social science teacher, in another a biology teacher. This is likely to produce an environmental education which is piecemeal, sketchy, and quite incomplete. Undue repetition of such topics as air and water pollution occurs, while topics as essential as futuristics and the "Spaceship Earth" concept are omitted entirely. Such an education leads to simplistic one-problem-one-solution views of environmental problems, rather than the holistic world view which is required of the public today.
>
> A more satisfactory high school curriculum in EEE could include, for instance, the following components:
>
> Teachers in the humanities should contribute to fostering that love of, and respect for, the natural world which is obviously the most sound basis for preventing environmental degradation. Books such as Victor Scheffer's Year of the Whale are appropriate. Much symphonic music is based upon an appreciation of natural environments, such as Beethoven's Sixth Symphony and DeBussy's Le Mer. (Much contemporary rock music is equally appropriate to the "Rachel Carson" model.) The participation of art and photography classes is obvious. The curriculum in physical education and recreation should be the basis for adult pastimes which are not in conflict with environmental quality. Courses in mass media should deal with environmental anomalies, ironies, and non sequiturs found therein.
>
> Teachers in the social sciences should contribute to the learner's knowledge of the environmental costs of economic growth; political power structures and how to en-

list their aid for effective action; the "Spaceship Earth" concept; the contrasting world views of various cultures having hunting-gathering, pastoral, agricultural, and industrial economic bases; the contemporary implications of such venerable values as freedom.

Teachers of science can deal with factual data regarding the state of the environment and can teach methods of inquiry for gathering such data. Basic principles such as evolution, homeostasis, and entropy can be developed through examples in the topics of pollution and recycling. With films and field trips, teachers of such courses as natural history can contribute to the appreciation of the natural world which underlies all ecologically ethical practice. (8, pp. 4-5).

PROCEDURES

The procedures which were originally proposed for meeting our twin objectives had to be greatly modified in order to achieve a satisfactory degree of success. We will first describe the proposed procedures, and then the reasons for modification, and finally the nature of the modifications.

It was proposed that a core group of three would be chosen from the CVHS staff, one teacher each in English, social sciences, natural sciences. These, together with the project director, students, and building administration would comprise the core planning team through the year. As was stated in the proposal, the three would be released from a portion of the normal daily teaching load in order to:

1. Consider and adopt themes to be used in their several courses.

2. Infuse new instructional units into their courses during the 1971-72 academic year, and assist other interested teachers in doing the same.

3. Discover means by which to contribute their expertise to each other's classes.

4. Build their knowledge by reading and discussing appropriate books and articles. These will be recommended by the Project Director, by the teachers themselves, and by university consultants.

5. Examine and select appropriate learning materials for student use, including texts, reference books, novels and short stories, films, and such simulation games as "Extinction" and "Pollution."

6. Try the most promising of these materials in classes, in order to gain student feedback on their merit, and to determine which effect the greatest behavior change in students.

7. Maintain complete records on lessons, units materials, and themes developed. These records will be edited and compiled throughout the year to form the "Operating Manual."

8. Examine environmental education programs in other school districts, with an eye to incorporating successful features and avoiding unsuccessful ones.

9. Confer with students, parents, and other community persons, and with other school system personnel, in order to gain feedback, provide information and otherwise promote community contribution to, and acceptance of, such a program.

10. Whereas the creation of new interdisciplinary courses is not

anticipated, it is possible that the group's discussions may point to the desirability of attempting such courses during subsequent years. Such courses may even be introduced as one semester or short term "mini-courses" during second semester of the 1971-72 year. Thus, the planning of such courses(s) may become a function of the group; it is impossible to predict at this time. (8, pp. 19-20).

It was judged more realistic to involve a small, multidisciplinary team of teachers at a rather high level of intensity than to hope that a majority of the staff could be so heavily involved. It was proposed, however, that other teachers would join the planning group from time to time, freed by substitute teachers, in order that additional classes would become involved. The group would be joined by consultants from Oregon State University, and elsewhere, as their expertise was required. A citizens' advisory committee would assist the planning group. The group's science teacher would be - and was - released from teaching for an additional part of the day, in order to serve as associate director of the project (director serving only .5 time).

In point of fact, an effective central planning group never did materialize at CVHS. Luckily, the majority of the teachers at the school, representing a diversity of disciplines, did cooperate in introducing appropriate lessons, units, or materials into their classes. And, in those areas where our efforts were most frustrated - humanities and social sciences - we were able to develop some highly successful units and materials by hiring a part-time teacher and some unit writers.

The reasons for the diversion from our original proposal are several, but none can be divorced from the community context in which the project was initiated. Suffice it to say that in summer 1971: the school budget was not approved until its third presentation to the voters; school board elections revealed a shift in the community's expectations regarding its schools and their administrators; the superintendent resigned after the second budget defeat, effective June 15, 1972. In this setting, there was also a lack of complete accord between different levels of administration regarding the appropriate objectives of the schools, including Crescent Valley High School (CVHS).

Therefore, the project was necessarily directed from a rather different position than that from which it had been proposed.

A second major factor causing diversion from proposed procedures was that the three teachers chosen for the central planning team, by a stroke of great bad luck, all had to deal throughout the year with rather intense and distracting problems in their personal lives.

A third factor was that budgetary problems had precluded the district's plans for preparing the teachers for the several innovations scheduled for Crescent Valley High. This problem was particularly

severe in the social sciences-English area, where a concentration of innovative schemes were to be tried. Therefore these innovations, meant to be mutually complementary, tended to be competitive for and distractive of the teachers' attention. Thus, the school was typified by considerable confusion at its opening, virtually precluding significant accomplishment of project objectives during the entire first semester. (All this was compounded by a carpenter's strike which delayed the opening of school.)

A fourth factor is that the project director perceived himself to be in a very tenuous and delicate position, requiring that the proposed implementation be accomplished by a process of unusually gentle persuasion, if indeed it were to be accomplished at all. This situation was created partly by the first factor above, aggravated by the second and third. It was further created and aggravated by factors external to the school district, and stemming from his position as a young university faculty member in a period of high vulnerability for the entire university community. His school within the university, and his position within that school, were particularly vulnerable due to dropping enrollments and other circumstances.

A fifth major factor is that the pool of teachers from which we could choose our core team was restricted by a number of circumstances quite beyond the control of project personnel.

These major factors, and many subsumed within them, led to the following modifications:

Throughout the school year, the director and associate director appealed directly to the good will of teachers throughout the school, appealing to them to participate in the project. This was normally done on a one-to-one, informal basis, as the teachers seemed much more receptive to this approach than to larger, more formal meetings. The response was gratifying, given the above problems. Project personnel were able to give the teachers some conceptual guidance as well as logistic and material assistance, but somewhat less of the first of these than had been hoped for when the project was proposed.

Although special courses were not entirely consistent with project philosophy, the director did not discourage the team when it began to develop and teach such a course in November. At this point, the director welcomed any show of positive action by the team, with hopes that it would evolve into a more appropriate effort during second semester.

Early in March, the English and social science members of the team withdrew from the group, stating that they could not in good conscience continue at their present low level of involvement. At this

juncture, the development and trial of supplementary materials was at last underway throughout much of the school, but a considerable void still existed in the English and social studies area. It was decided that the best accommodation to this situation was to hire a part-time English and social-studies teacher immediately. She would teach two periods a day and would be expected to devote considerable time to preparation and documentation of lessons. The project director would furnish the general outline of the units; she would be responsible for the details. Unlike the regular staff in the schools, she would be primarily and directly responsible to the project director. It was thought that she should work in Corvallis High School rather than CVHS for several reasons, including the fact that her role would not be compatible with the team teaching being attempted at CVHS. Thus, while the new courses would not be a part of the proposed process at CVHS, we hoped that we could now produce an important element of the proposed product, even if in a different setting. The Corvallis High administration readily agreed to schedule two special courses during the last nine weeks, and the staff and department chairmen as readily agreed that regular English and social studies credit could be granted for the courses as outlined.

With the assistance of personnel and placement directors, some ten candidates were selected for interviews. Today's very difficult job market worked to our advantage here, as most of the interviewees were of excellent caliber. Mrs. Joanne James was hired and taught the two courses described below:

1) A U.S. history course emphasizing natural resource conservation, using Stewart Udall's The Quiet Crisis as the principal "textbook." The unit concluded with study of some contemporary conservation groups in the private sector, and their various objectives and modus operandi. Such groups were viewed as examples of American participatory democracy in action. Special emphasis was placed upon The Nature Conservancy as an illustrative organization.

2) A literature course using prose and poetry with environmental themes, especially man's relationship to the natural world. Edward Abbey's Desert Solitaire became the principal vehicle, supplemented by poems and essays from Audubon magazine and other sources. The Hollywood film version of Romain Gary's novel The Roots of Heaven was also utilized.

While these were special courses, it must be emphasized that the first was a valid U.S. history course which could be integrated into a standard one-year history course without sacrificing the integrity of the discipline. Likewise, the second course was a valid literature course whose materials could be scattered throughout a standard literature course. This use of these units would be optimally consistent with the "Rachel Carson High" philosophy.

In an additional attempt to develop satisfactory materials in the social sciences area, two of the other interviewees were hired to develop a type of unit of which the project director had conceived, and knew of no extant examples. These would be case studies of conservation battles, complete with discussion questions and student activities. The objective of these units again would be to provide concrete examples of American participatory democracy at work, through the efforts of organizations voluntarily supported by interested segments of the citizenry. The two case studies developed dealt with:

1) The Miami jetport controversy, in which the Dade County Port Authority was opposed by a coalition of conservation organizations, and

2) The Cascadia Dam controversy, in which the Army Corps of Engineers is today being opposed by a similar coalition of organizations in Oregon.

Consistent with project philosophy, every attempt has been made to present the issues in a neutral and unbiased manner, leaving conclusion-drawing to teacher and student.

With these last-quarter alterations in our procedures, we significantly closed the gap between our stated and our realized objectives. The process during summer 1972 has principally been one of documenting on the part of director and participating teachers alike.

RESULTS

Subsumed within the two general objectives of this project were six somewhat more specific objectives (8, pp. 7-8). We shall quote each of these from our proposal, followed by results and comments pertaining to that objective.

> 1. To prepare an operating guide for interdisciplinary environmental-ecological education which makes the most effective use of existing instructional resources (courses, materials and teachers). Effectiveness will be judged by the agreement of teachers and administrators during spring of 1972 to implement a majority of the plans in the manual during the 1972-73 school year.

This report, and especially the 22 appended reports from teachers and others, constitutes the "operating guide" referred to. (We avoided the term "curriculum guide," as we anticipated that our document would be more specific and detailed than typical curriculum guides, containing daily lesson plans and recommended materials. The term "operating manual" was alternatively used, borrowing from R. Buckminster Fuller's Operating Manual for the Spaceship Earth.)

Data regarding teachers' plans for 1972-73 is impressionistic and was gathered informally. We think it is clear that nearly all of the teachers involved plan to re-use and further develop the lessons and units tried during 1971-72. Some noteworthy examples follow:

The experimental nine-week history course introduced by Mrs. James at Corvallis High has led directly to a semester course to be initiated by three of the regular social sciences staff at that school.

The extensive psychology unit developed by Gert Branthover at CVHS will be continuously added to and revised by Miss Branthover over the next several years, following her standard procedure for successful new units. She considered the present unit highly successful. One of her students is devoting time during the summer to develop another projection-slide presentation similar to that he used in the unit.

Mr. William Johnson did his student teaching at CVHS because of his interest in the project, and the interest of project personnel in contributions he could make to the project. Mr. Johnson has been hired to teach at CVHS in 1972-73, because of his very considerable success as a student teacher there. Thus, not only will his physics unit be used again, but he is introducing a new course in forestry, based upon his experience as a citizen-activist in the area of forest conservation. Thus this course, quite consistent with the project and its objectives,

is a direct outgrowth of the project. Thirty-three students have registered for fall semester.

2. To form selected students and teachers into an effective and efficient curriculum planning group. Effectiveness and efficiency will be measured by the degree to which the group meets its critical progress dates.

This objective was not met, as will be clear from the foregoing chapter on "Procedures." Nevertheless, it should be noted that:

The project director and the part-time personnel hired in the spring did form highly effective two-person planning groups, albeit obviously restricted in numbers and representation.

The desired student participation in planning was achieved to a degree in certain courses, if not in school-wide planning. Note especially the psychology unit by Miss Branthover.

Groups of teachers did form planning groups around the project, however temporarily and sporadically. Note the report on the Jackson Creek Project, and the editor's note in the algebra report. The two typing teachers planned together effectively throughout the year, with each other and with the chemistry teacher (see their respective reports). There was considerable cross-disciplinary interteacher cooperation within the project and the school as a whole, as will be further noted under objective (4) below.

3. To increase significantly the involvement of university and community resources in the formation of a total EEE curriculum. Increased involvement will be measured by the participation of at least three university departments and three community groups in the planning discussions by June, 1972.

Obviously, the specific objective of participation in the proposed but ill-starred planning discussions could not be met, but the more general goal of community participation was met rather adequately, especially with reference to the university community. The principal form of participation was as resource people who visited classes at CVHS. In the fall the project director and associate director drew up a list of known community resource people, together with brief descriptions of their competency areas. These persons had been previously contacted and indicated willingness to serve. Copies of this list were distributed to all teachers at CVHS, and teachers were frequently invited, in informal conversation, to utilize the services of the persons listed. We found that it is not always easy to convince teachers of the values of such community participation; we shall comment upon this under "recommendations," below. Nevertheless, there was a gratifying

level of resource-person participation in the project. Some examples which were very well-received at CVHS:

Professor John Mirgle, OSU Department of Mechanical Engineering, spoke to a driver education class on industry progress in reduction of exhaust emissions.

Dr. Fritz Bartsch, Director, Corvallis branch of the Environmental Protection Agency, spoke to an all-school assembly on the general problems with which the EPA deals.

Dr. Donald May, EPA, demonstrated water-monitoring equipment in two science classes, getting students started on monitoring projects of their own.

A group of wildlife management majors from OSU conducted the biology classes on a field trip to William Finley National Wildlife Refuge.

A number of science education students from OSU worked as aides in classes, assisting them in arranging field trips, drawing up bibliographies, and the like.

Norman and Patricia Coon, owners of a local grass-seed farm, presented a film and led a discussion concerning the grass-seed industry, which has been subject to much controversy due to its field-burning operations.

A team of public health nurses visited the child development classes to show various contraceptive devices and to discuss the use and comparative effectiveness of each.

Mr. William Saltzman of the Oregon Game Commission helped a group of teachers initiate a study of the creek which runs through campus.

The Northwest Regional Educational Laboratory tested computer simulations of ecological problems on the CVHS computer terminal, which OSU had provided partly because of NWREL and OSU interest in and support of the Rachel Carson Project.

Howard Taylor, an Oregon wildlife artist, showed paintings and described techniques in art classes.

In addition to the above activities at CVHS:

Dr. Francis H. Shaw, OSU Department of History, visited the special U.S. history class at Corvallis High, to discuss the relationship between Progressivism and the conservation movement in the post-Civil War period.

In the development of the case study on the proposed Cascadia Dam, cooperation was received from local conservation groups and from the Portland office of the Army Corps of Engineers.

Local industries tentatively agreed to provide re-cyclable waste material to the district in response to the initial queries of an industrial arts teacher working in cooperation with the project director. These materials would be used in industrial arts classes in the district.

Dr. Joe B. Stevens, OSU Department of Agricultural Economics, was retained as a project consultant through the cooperation of that department. Since circumstances, described previously, limited his opportunity to provide consultation, he kindly provided a position paper for inclusion in this report.

The above examples of community cooperation, as well as others, are described in the 22 appended reports.

4. To encourage high school teachers to develop course plans for environmentally-related topics on an interdisciplinary basis. Effectiveness will be measured by the participation of teachers in every major discipline area in the development of sample interdisciplinary course plans to be included in the "Operating Manual" by May, 1972.

Here, fairly objective data is available and is presented in Table I. It can be seen that the four levels of participation approximate a decreasing involvement, proceeding from left to right, from A to D. Some further explanation is necessary. The numbers total to more than the number of teachers on the CVHS staff, since each teacher with an assignment in two or more subject areas is tallied in each, and his level of participation in each is considered separately (one teacher may be level A in one subject area and level C in another). Within each subject, no differentiation or weighting is attempted with respect to number of periods taught, e.g. a full-time English teacher and a part-time English teacher are each represented by one tally in the appropriate row.

A teacher may be placed in column B for any of several reasons: his participation was too brief to justify a report; or his report may have been of insufficient quality to merit inclusion without unduly heavy editing; or his student teacher, rather than he, may have developed the project-related lesson or unit, albeit under his general supervision. The columns are only approximations of levels of involvement. For instance, a teacher may be in column A because he engaged in but a single lesson, wrote it up, and it was included among the appended reports. By contrast, a teacher may be in column B because his student teacher, not he, developed a four-week unit, wrote it up, and it was appended to the present report. So, the students in

TABLE I

Participation in Project Activities, by Subject Area

Subject Area No. of Teachers	Level of Participation A	 B	 C	 D
Natural Sciences (5)	3	2	-	-
Social Sciences (5)	1	4	-	-
English (6)	-	3	1	2
Mathematics (4)	-	2	-	2
Modern Foreign Languages (3)	2	1	-	-
Industrial Arts (3)	-	2	-	1
Business (2)	2	-	-	-
Art (2)	-	1	-	1
Health & P.E. (4)	-	1	3	-
Music (3)	-	-	-	3
Home Economics (2)	2	-	-	-
Miscellaneous (4) (Psychology, Driver Education, Yearbook, Journalism)	1	2	-	1
Totals	11	18	4	10

Explanation of Levels:

A - Participated; wrote or contributed to one of the appended 22 reports.

B - Participated; did not contribute directly to reports.

C - Included some appropriate materials in courses, but not as result of project.

D - No known participation.

the latter class were actually much more heavily involved in project activities than were the students in the former class. It should also be noted that there was probably a modest measure of environmental-ecological studies in the classes of some teachers in column D - project personnel simply not being aware of this.

It can be readily seen that all of the subject categories were represented in columns A and/or B except music. This is due to no fault of the music teachers: project personnel simply did not make contact with them amid the difficulities of trying to achieve success in the other areas. This situation was further aggravated by the fact that each music teacher was in the building only one hour per day, thus minimizing our contact with them.

The table rather accurately reflects a high level of success in the natural sciences, business, modern foreign languages, and home economics. The degree of involvement in these four areas follows the order in which they have just been presented: environmental studies received major consideration in science classes, while participation by home economics teachers was more limited, partly due to lack of sufficient student signup for a planned second-semester course, "The 'Eco' in Home Economics."

The table also reflects somewhat the problems experienced in the English-social sciences area, though the figures may belie the problems: although eight of eleven teachers in these areas participated, six of these eight known contributions were rather limited in extent, and the other two produced no useable writeups. It must be re-emphasized that the English-social sciences teachers are not necessarily to be faulted for this, as they were faced with problems and pressures which, in general, probably exceeded those faced by other teachers in the school. Again, it was in these areas that we finally hired part-time personnel to accomplish some of our objectives.

5. To lessen student apathy towards their high school education through participation in curriculum planning, project management, community action research, and course experimentation. Primary measurement will be applied to those students who actively participate in the project during 1971-72. Behavior and attitudinal change will be measured by instruments designed by evaluation experts from Oregon State University.

That at least some students participated actively in the above named activities is clear from the appended reports. Note especially the reports of Gert Branthover and Wayne Spletstoser. No objective measurement was applied. A primary reason for this was because the original budget provided for a one-half time Manual Editor, who would be a faculty member or advanced degree student in the School of Education at Oregon State University. This person was to have two functions:

1) To compile and edit the "Operating Manual for Rachel Carson High," as his title suggested.

2) To devise and administer evaluation instruments (he was to have some competency in this area), with the assistance of university colleagues.

Since the grant award was for a lesser amount than that requested, it was necessary to eliminate this position from the project. Function number (1) above, the compiling and editing of the manual, was assumed by the project director. Function (2), evaluation, simply was not accomplished. Again, the resources of time and energy available to the project personnel were heavily devoted to overcoming obstacles to implementation. Energies diverted to an adequate evaluation scheme would have left little or nothing to evaluate: the project could then have been judged a failure by even the most cursory examination, and validly so.

6. To increase significantly students' respect and concern for their environment. Measurement will be applied primarily to students participating in the project during 1971-72. Evaluation topics and measurement techniques will be suggested by the planning group and completed by evaluation experts from Oregon State University.

The comments under objective (5) above pertain here also.

A penultimate comment on our results. Of the 22 appended reports, 15 were produced at CVHS, nine of those by regular CVHS teachers, one by a teacher in collaboration with the project director. We consider this a reasonably gratifying result, considering the confusion attendant to the first semester of a new school, and the difficulties which had preceded that opening. The other seven reports generally represent ideas that had to be developed in settings other than Crescent Valley, and that we judge worthy of inclusion in our materials in order to achieve a more complete representation of the secondary-school curriculum.

The origin of the reports is analyzed in Table II.

TABLE II
Origin of 22 Reports

Source	Number
CVHS teachers	10
CVHS student teachers	3
OSU students serving CVHS in some capacity	2
Project employees:	
Teacher (English, social studies)	2
Case-study writers	2
Corvallis High teacher (social studies)	1
Junior high teacher (industrial arts)	1
Economics consultant	1
Total	22

Additional evaluation is to be found in the comments of the authors of the 22 appended reports.

CONCLUSIONS AND RECOMMENDATIONS

Our conclusions are drawn with reference to the two general objectives stated in the preface:

A) We did pervade the curriculum of a high school with environmental education, and with participation by most teachers. However, this was accomplished only with some difficulty, and the level of involvement by some participants was lower than we had hoped, especially in certain subject areas. On the other hand, some teachers achieved or exceeded our expectations.

B) A document, the proposed "Operating Manual for Rachel Carson High," was achieved, and comprises this report and its separately-bound appendices. In general it matches our expectations with respect to the lessons or units prepared by teachers, but falls short of expectations with respect to reporting a satisfactory process for planning and coordinating an all-school program in environmental education. We have attempted to remedy this deficiency in part with the following set of recommendations. Recommendations a - i are based wholly on our own local experience; their generalizability to other situations may or may not have been demonstrated elsewhere:

1) If the project emphasis is upon development of materials, then regular teachers should participate only insofar as they show a ready inclination and ability to do so. Most teachers are subject to too many competing demands upon their time and energy. More satisfactory results can be obtained by the hiring of special teachers who are primarily responsible to the project, and who are not involved in extracurricular activities or the teaching of other subjects. Or, materials can be written by specially-hired employees who then try the materials in regular classes, either taking over the class themselves for a time or having the teacher use the materials. Revision and possible retrial would follow.

In either case, the approval of staff and principal is a necessary antecedent to successful classroom trial of materials. A selling-point for such project activity in the school is that staff teachers may experience a lighter load or more favorable student:teacher ratio as a result.

When these methods were implemented at Corvallis High, acceptance of the project's part-time teacher was accomplished with generally good success. The principal was approached first, and gave his approval subject to that of department chairmen. These were next approached, and gave their approval subject to acceptance by staff teachers, which they would seek in the next regular departmental meetings. With their knowledge, some of the teachers were also contacted prior to the departmental meetings. Thus, a solid groundwork of acceptance was laid at the outset. While some teachers continued to question the

presence of Mrs. James in Corvallis High throughout her tenure there, the tide of opinion clearly was one of acceptance.

A key to this acceptence, surely was that no unusual demands were being made on the teachers themselves.

2) A "democratic" process which involves such elements as a Citizens' Advisory Council, student membership in a planning group, and a wide base of teacher participation is not compatible with a short-term project in which acceptable materials must be produced. Any two of the three underlined factors may be compatible within one project, but all three are not easily accommodated.

3) If the project emphasis is upon the process of pervading the entire curriculum (rather than upon the production of materials), then a number of recommendations arise, though not all may be relevant to any one local situation:

a) There must be strong and consistent support from the community, the teachers, and from all levels of administration. This should be assessed and, if necessary, won, in the pre-proposal period.

b) By corollary, there must be a spirit of harmony between community and schools, with community support of innovation in education.

c) The number of concurrent innovations in a single school should be limited to those for which proper inservice training of teachers, and acceptance by teachers, can be accomplished.

d) There must be a pre-proposal history of building acceptance of the proposal, among teachers and administrators. Whereas the teacher advisory committees for the CVHS curriculum had included or emphasized environmental education, and the then superintendent supported the proposal, this was not entirely sufficient. Now that Public Law 91-516 is - hopefully - an established fact, aspiring grantees can take more time to gain a broad base of support in the pre-proposal stages. This was less feasible in the first round of awards, when there was a span of only a few weeks between the appearance of the first proposal guidelines and the deadline date for submission of proposals.

e) Some teachers are extremely reluctant to accept freed time either on a regular daily basis or through the occasional use of an all-day substitute teacher. This factor must be assessed in any planning of procedures.

f) In fact, a project is likely to be affected by the entire wave of teacher power, militancy, and unionism of recent years, as well as by the concurrent evolution of youth subcultures as we find them today. The extent of authority by administrator in relation to teacher, or by teacher in relation to student, appears to have declined in recent years, and at any rate is influenced by social trends which must be weighed, and an attempt must be made to capitalize on whatever local situation prevails.

g) A new school may not be the optimal setting for a Rachel Carson Project, due to the confusion inherent in such a situation, especially when it is accompanied by labor disputes, budget defeats, and similar events. Again, numerous variables must be assessed, including: the number of possibly competing innovations being tried; the selection criteria for the school's teachers; the ability of those criteria to be met from within the pool of available teachers; the potential or lack of potential apparent in the established schools of a district.

h) The project director or other responsible administrator must be prepared to relieve key persons of low productivity from their responsibilities. In this project we were not prepared to do so, for very substantial reasons, as indicated earlier in the "Procedures" chapter.

i) One phase of preservice, inservice, or in-project teacher education which may need some emphasis is the use of community resources. An example from our own project is a teacher who wished to purchase an expensive water pollution testing kit. We prevailed upon him, successfully, to contact a government agency which not only provided the necessary materials and apparatus, but expert instruction in their use as well.

A second emphasis would be the proper planning of field trips, and recognition that field trips may have different objectives. While some may appropriately require little of the students in advance preparation or the completion of assigned tasks during or following the trip, others are not so. We found that some teachers held only the former concept of field work, fearing that to associate work with a trip would spoil the trip. One refutation of this misconception can be found in the appended psychology unit by Gert Branthover, who put considerable responsibility upon students for the careful planning of a trip which they found very gratifying.

We wish here to make two recommendations based not upon our own experience but upon our observation of a spectrum of other environmental education programs:

j) Teachers (and project directors) must operate within some disciplined definition of environmental education. If they insist upon promiscuous labeling of anything they choose to study as "environmental education," then in fact there will be no environmental education. Currently there is a tendency to sacrifice understanding of man-earth relationships in favor of man-man relationships. (9, p. 570).

This point is illustrated by, for instance, an "environmental" curriculum project which includes among its activities: make a wall of various textures, make a cardboard cutout of yourself, make a science-fiction movie; or a report of a high school project which consisted of courses such as, "crime, housing, Africa, Afro-American history, Hispanic history," and concluded that this was "Environmental Studies in its broadest sense, which is openness, which is choice, which is individual work, which is people becoming independent and working with each other."

To us, this seems rather undisciplined.

k) Teachers (and project directors) themselves need extensive education in environmental concepts, lest the curriculum become a mere series of a-disciplinary "mini-Earth-Days," employing recent films and articles that simply catalogue our environmental ills, especially air and water pollution. Students are now well aware of these as a general problem and are ready to move on to a more in-depth study which respects the integrity of the disciplines. Case study approaches are suggested. Included in the humanities program should be a positive celebration of the earth - love must precede tears, love must precede anger - and these must precede commitment. (9, p. 570).

We feel that our 22 reports satisfy recommendations (j) and (k) very well.

l) Finally, we recommend that additional "Rachel Carson Projects" be attempted, and the best materials emanating therefrom be given wide dissemination. There were many possible units and lessons which project personnel conceived of, but had no opportunity to develop within this one brief experiment. It should definitely be tried again, in many sites.

DISSEMINATION ACTIVITIES

The project is achieving visibility nationally. An article describing it was published in the Phi Delta Kappan in May 1972: "The Rachel Carson Project," pp. 568-570. A similar article is to be published in The Science Teacher in October 1972: "Environmental Studies in the Rachel Carson Project." Both of these were written by the project director. In addition, the first article is to be reprinted in a national professional journal in environmental education during the 1972-73 academic year.

Copies of the first article were also made available to those attending the annual conference of the Conservation Education Association in Lincoln, Nebraska, in August 1972. The project director will present a paper describing the project at the Northwest regional meeting of the National Science Teachers Association in Spokane, Washington, in October. Also in October, he will be a panel member at the Menucha Conference for environmental education in Oregon, at which time he anticipates describing the project and/or making papers available.

We perceive that these papers serve a different function from that of the present report, hence they emphasize the philosophy and achievements of the project, and tend not to focus upon the problems of implementation, which may be peculiar to the local situation and which may be unduly discouraging in a brief report.

We have also supplied information in response to written requests from around the nation, and have had occasion to disseminate information via telephone and mail to other environmental educators.

Finally, the project has been reported briefly in a newsletter of the National Association of Independent Schools, and in a widely-disseminated booklet from the Environmental Education Office.

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2. _____, "The Science Curriculum: Unfinished Business for an Unfinished Country," Phi Delta Kappan, 51 (no. 7): 353-356, March 1970. (A proposal for a new interdisciplinary high school course which deals with several themes relating human values, environment, and technology. The themes are explicated.)

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8. "Operating Manual for Rachel Carson High: A Proposal to Develop Supplementary Materials under the Terms of the Environmental Education Act," Corvallis, Oregon: School District 509J, May 26, 1971, 32 pp., unpublished.

9. Tanner, R. Thomas, "The Rachel Carson Project," Phi Delta Kappan, 53 (no. 9): 568-570, May 1972.

APPENDICES (bound as 7 volumes)

I. MAN AND NATURE - A LITERATURE COURSE, by Joanne James

II. THE AMERICAN AND HIS ENVIRONMENT - A SOCIAL SCIENCES COURSE
by Joanne James

III. ENVIRONMENTAL STUDIES IN THE PHYSICAL SCIENCES

The Application of the Laws of Thermodynamics to the Earth System, in a Physics Class, by William T. Johnson

Chemistry, by Wayne Spletstoser

IV. ENVIRONMENTAL STUDIES IN SEVERAL SCIENCE COURSES

Human Ecology, Science and Society, and Marine Biology
by Jack Whitney and Randy E. Wilkinson

Natural History of Oregon, by Jerry Colonna, Helena Zimmerman, and Judith Koerner

V. CASE STUDIES OF CONSERVATION "BATTLES"

Cascadia, by Virginia Avery

The Miami Jetport Controversy, by Judith Koerner

VI. ENVIRONMENTAL STUDIES IN NINE COURSES AT CRESCENT VALLEY HIGH

Psychology: Life Gives Me Back the Same, by Gertrude Branthover

Typing and Ecology, by Marjorie Sutherland and Diana Glenn

Architecture: Environmental Living, by Larry Kirkpatrick

Modern Foreign Languages
French, by Olivia Dorman
Spanish, by Joseph Martin
German, by Faye Bone and R. Thomas Tanner

A Unit in Algebra: The Exponential Function of Population Growth, by Paul Sanders

Ecological Opportunities in a World Area Class
by Doug Bashor

Home Economics, by Jeanette Wagner and Polly Johnson

VII. ENVIRONMENTAL STUDIES: FIVE MISCELLANEOUS REPORTS

Futurology, by Karen Christianson

The Finley Wildlife Refuge Program, by Christopher Carey, Wayne Logan, Wayne Bowers and William Harris

The Jackson Creek Project, by Fred Woods

A Proposal for the Utilization of Industrial Waste Material by Corvallis Schools, by George Perreard

The Economics of Environmental Quality, by Joe B. Stevens